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EXAMINER

TRAN, THIEN F

ART UNIT

PAPER NUMBER

2811

DATE MAILED: 08/06/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/944,985

Applicant(s)

BHATTACHARYYA, ARUP

Examiner

Thien Tran

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-84 and 117-124 is/are pending in the application.
- 4a) Of the above claim(s) See Continuation Sheet is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,2,4,14,18,19,56,57,59,63,73,74,76,80 and 84 is/are rejected.
- 7) ☒ Claim(s) 7,62 and 79 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).  
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_.
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2. 6) ☐ Other: .

Continuation of Disposition of Claims: Claims withdrawn from consideration are 3,5,6,8-13,15-17,20-55,58,60,61,64-72,75,77,78 and 81-83.

## **DETAILED ACTION**

### ***Election/Restrictions***

Applicant's election without traverse of claims 1-2, 4, 7, 14, 18-19, 56-57, 59, 62-63, 73-74, 76, 79, 80 and 84 in Paper No. 8 is acknowledged.

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-2, 56-57 are rejected under 35 U.S.C. 102(b) as being anticipated by Shimoji et al. (USPN 5,332,915).

Shimoji et al. discloses a gate stack (Fig. 1) comprising a tunnel medium 5; a high K charge blocking and charge storing medium 4 disposed on the tunnel medium; and a high dielectric film 2 having a high dielectric constant of at least 10 which is characterized as an injector medium to provide charge transport by enhanced tunneling, the injector medium disposed on the high K charge blocking and charge storing medium 4.

Regarding claims 56-57, Shimoji et al. further discloses a memory cell (Fig. 1) comprising a substrate 5 and N+ doped regions that inherent form source and drain regions on opposite sides of the gate stack.

### ***Claim Rejections - 35 USC § 103***

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The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-2, 14, 56-57, 63, 73-74, 80 and 84 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shimoji et al. (USPN 5,332,915) in view of Bass, Jr. et al. (USPN 5,870,470).

Shimoji et al. discloses a gate stack (Fig. 1) comprising a tunnel medium 5; a high K charge blocking and charge storing medium 4 disposed on the tunnel medium; and a high dielectric film 2 having a high dielectric constant of at least 10. Shimoji et al. does not specifically disclose the high dielectric film 2 including SRN (silicon rich nitride). Bass, Jr. et al. discloses a gate stack (Fig. 6) having an injector medium 35 of SRN. It would have been obvious to a person having ordinary skill in the art at the time the invention was made to form the high dielectric film 2 including SRN as an injector medium as taught by Bass, Jr. et al. to provide good charge injecting properties that provide appreciably enhanced charge conductance.

Shimoji et al. further discloses a memory cell (Fig. 1) comprising a substrate 5; N+ doped regions that inherently form source and drain regions on opposite sides of the gate stack; and a gate 1 disposed on the gate stack.

Regarding claims 73 and 84, Shimoji et al. in view of Bass, Jr. et al. does not explicitly disclose the memory cell being used in an electronic system comprising a processor and a nonvolatile memory device coupled to the processor, the memory

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device including an array of memory cells coupled to a grid of row lines and column lines; row select circuitry and column select circuitry wherein the row select circuitry and the column select circuitry cooperate to select a memory cell for application of a programming voltage. A processor and a nonvolatile memory device coupled to the processor, the memory device including an array of memory cells coupled to a grid of row lines and column lines; row select circuitry and column select circuitry cooperated to select a memory cell for application of a programming voltage are conventional elements in a conventional electronic system. It would have been obvious to form the memory cell of the modified Shimoji et al. as the memory cells in the conventional electronic system having the conventional elements as described above for the advantages that the modified Shimoji et al. provides.

Claims 4, 18-19, 59, 76 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shimoji et al. (USPN 5,332,915) in view of Bass, Jr. et al. (USPN 5,870,470) as applied to claims 1, 56, 73, 84 above, and further in view of Sadd et al. (USPN 6,444,545).

Shimoji et al. in view of Bass, Jr. et al. does not disclose the tunnel medium 5 including tunnel  $\text{Al}_2\text{O}_3$ .  $\text{Al}_2\text{O}_3$  and  $\text{SiO}_2$  are dielectric materials known in the art and routinely used as materials for tunnel medium in semiconductor device as shown for example Sadd et al. (col. 2, lines 27-31). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to select any one of these materials as a suitable dielectric material for the tunnel medium of the modified Shimoji et al. to provide good FN tunneling electroconductivity, since it has been held to be

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within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of design choice. In re Leshin, 125 USPQ 416.

Regarding claims 18-19, Shimoji et al. and Bass, Jr. et al. does not specifically disclose the high K charge blocking and charge storing medium 4 including nano crystals for providing charge trapping charge centers. Sadd et al. disclose a gate stack (Fig. 8) comprising a charge blocking and charge storing medium 35 including silicon nano crystals 32. It would have been obvious to a person having ordinary skill in the art at the time the invention was made to form the high K charge blocking and charge storing medium 4 including nano crystals as taught by Sadd et al. so that much of the charge would remain in the storage medium 4 due to trapping in the nano crystals. As a result, charge leak off from the medium 4 would be reduced.

#### ***Allowable Subject Matter***

Claims 7, 62 and 79 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: Prior art references do not teach or render obvious a memory device wherein the high k charge blocking and charge storing medium includes silicon-rich  $\text{Al}_2\text{O}_3$ .

#### ***Conclusion***

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thien Tran whose telephone number is (703) 308-4108. The examiner can normally be reached on 8:30AM - 5:00PM Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on (703) 308-2772. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9318 for regular communications and (703) 872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

tt  
July 25, 2003



Thien Tran  
Patent Examiner  
Technology Center 2800